

SOV/2416

Lebedev, V.V.  
11(2,7)

PHASE I BOOK EXPLOITATION

Gazosnabzheniye vostochnykh rayonov SSSR na osnove gazifikatsii tverdykh topliv (Supplying the Eastern Regions of the USSR With Gas Produced by Solid Fuel Gasification) Moscow, Gostoptekhnizdat, 1959. 214 p. 2,000 copies printed.

Ed.: N.V. Shishakov, Doctor of Technical Sciences; Executive Ed.: T. D. Yefremova; Tech. Ed.: A.V. Trofimov.

PURPOSE: This collection of articles is intended for designing, planning, and scientific research personnel, as well as for engineers, technicians, and students specializing in solid fuel gasification.

COVERAGE: This collection of articles describes the problem of supplying the eastern regions of the USSR with synthetic gas derived from the gasification of solid fuels to overcome that area's lack of natural gas. Individual articles discuss the distribution of the region's coal deposits, the quality and types of coal encountered, gasification process, and the economics involved in the production and supply of the synthetic gas product. The author thanks V.S. Al'tshuler, Doctor of Technical Sciences. References accompany each article.

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PLANE I BOOK EXPLANATION 300/5731

Abdullayev, M. M. Institut gosyuchibit islopyayaysh

Gasification i goruyay toyliv (Fuel Gasification and Combustion) Moscow, Izdatel' AN SSSR, 1959. 227 p. (Series: Izv. Inst. Vol. 11) Kravtsov allp  
Illustrated. 1,000 copies printed.

Ed.: E. V. Lavrov; Ed. of Publishing House: V. E. Pukhovskiy; Tech. Ed.:  
I. N. Doroshina.

PURPOSE: This collection of articles is intended for scientific research workers  
and engineers studying combustion processes and solid fuel gasification.

CONTENTS: This collection concerns the theoretical and experimental study of the  
mechanisms of chemical reactions occurring in combustion and gasification.  
Results of the isotopic method of studying the gas generating process and its  
reactions, and the reaction of carbon monoxide and heated coal are analyzed and  
the pilot plants used in this study are described. Reactions of coal combustion,  
oxidation, methane dissociation and conversion are discussed and their  
equilibrium constants are calculated. The processes of methane oxidation  
by oxygen and synthesis-gas production by reducing natural gas with the sub-  
sequent reduction of oxidation products by carbon monoxide are considered as the ef-  
fect of an excessive amount of air on the burning process of pulverized solid  
fuel. The utilization of heavy petroleum residue and tar for combustion and  
gasification purposes is also discussed along with the principles of fluidization.  
Analysis, routine control and intensification of physical and chemical process-  
es by means of ultrasonic vibrations are also covered. No personalities  
are mentioned. References accompany all but the first article.

Altshuler, V.S., and G.P. Sechenov. Some Conditions of Normal Operation of  
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AVAILABLE: Library of Congress

Card 6/6

20/600/rel  
7-18-60

LEBEDEV, V.V.; POPOV, V.M.

All-Union Conference on the Coordination of Scientific Research on the Use of Fuel Gases in the National Economy. Gaz.  
prom. 4 no.9:54 S '59. (MIRA 12:11)  
(Gas as fuel--Congresses)

LAVROV, Nikolay Vladimirovich; KOROBov, Valeriy Vladimirovich;  
FILIPPOVA, Vera Ivanovna; LEBEDEV, V.V., otv.red.; IVANOVA,  
D.A., red.izd-va; BRUZGUL', V.V., tekhn.red.

[Thermodynamics of gasification reactions and of synthesis  
from gases] Termodinamika reaktsii gazifikatsii i sinteza  
iz gazov. Moskva, Izd-vo Akad.nauk SSSR, 1960. 97 p.

(MIRA 13:7)

(Gases)

(Thermodynamics)

26.2312

85083

S/139/60/000/004/038/044/XX  
E031/E413

AUTHORS: Lebedev, V.V. and Makirov, A.Ye.

TITLE: Determination of the Parameters of the Distribution  
of the Dimensions of Particles

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1960,  
No.4, pp.60-65

TEXT: The scattering properties of a cloudy medium can be used as a source of information about the distribution of the dimensions of the particles composing it. A similar problem was investigated by K.S.Shifrin (Ref.1) and leads to the inversion of a special form of the Fourier integral. The particle distribution curve is obtained by numerical integration with respect to the angles of scattering of the experimental distribution curve for the intensity of the light. In the present note an attempt is made to modify the problem and, using experimentally measured intensities of light scattered through three angles, establish the parameters of the distribution function. The use of a parametric representation of the particle distribution function simplifies the problem considerably. The distribution function for the particle dimension is taken in the form

$$dn(r) = Ar^{\mu}e^{-cr} dr \quad (2)$$

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E031/E413

# Determination of the Parameters of the Distribution of the Dimensions of Particles

where  $c$  (greater than zero)  $\mu$  (an integer greater than or equal to zero) are parameters of the distribution and  $A$  is a normalizing constant. If the medium consists of suspended reflecting particles, the intensity of scattered light depends only on the character of the distribution of the particles according to their dimensions. The assumption that multiple scattering has negligible influence leads to Eq.(5) for the intensity of light scattered through a small angle  $\beta$ . This type of integral has been calculated in explicit form by Shifrin for  $\mu = -2(1)2$ , and leads to the expression for the intensity of the form

$$I_{\mu}(\alpha, c) = \alpha^{-(\mu+3)} \varphi_{\mu+2}(k) \quad (6)$$

where  $\alpha = 2\pi\beta/\lambda$ ,  $\lambda$  is the wavelength, and  $k = 1/(\sqrt{1+c^2/4\alpha^2})$ . The functions obtained ( $\varphi_0 \dots \varphi_4$ ) are far from being sufficient to determine the parameters of the distribution function because  $\mu$  can have values greater than 2. Expressions for  $\varphi_5 \dots \varphi_{10}$  are

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E031/E413

Determination of the Parameters of the Distribution of the Dimensions of Particles

quoted. With the relations given, Eq.(10) is arrived at which can be used for the experimental determination of the parameters  $\mu$  and  $c$ , assuming a distribution of the form (2) above:

$$I_{\mu}(\alpha, c) = I_0 \frac{4\pi^2 n c^{\mu+1}}{\mu! \lambda^2 \alpha^{\mu+5}} \varphi_{\mu+2}(k) \quad (10)$$

The method is less strict than Shifrin's but it leads more quickly to the answer. There are 2 figures, 2 tables and 8 references; 7 Soviet and 1 English. X

ASSOCIATION: Moskovskiy institut neftekhimicheskoy i gazovoy promyshlennosti imeni I.M.Gubkina (Moscow Institute of the Petrochemical and Gas Industry imeni I.M.Gubkin)

SUBMITTED: August 22, 1959

Card 3/3



83357

S/139/60/000/004/014/033  
E032/E514

24.6900

AUTHOR: Lebedev, V.V.

TITLE: On the Conservation of Mesonic Charges *M*

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika,  
1960, No. 4, pp. 135-138

TEXT: The Dirac formalism has two disadvantages, namely, the nonconservation of the mesonic charges of nucleons and the fact that it cannot be used to formulate a relation with scalar, pseudoscalar and pseudo-vector meson fields, i.e. fields which preserve their properties on time reversal. It is argued in the present paper that these difficulties can be avoided if one uses the generalized Dirac equation

$$\frac{\hbar}{i} \epsilon_3 \frac{\partial \chi}{\partial t} + \frac{\hbar c}{i} \epsilon_1 \sigma \text{ grad } \chi + Mc^2 \epsilon_3 \chi = 0 \quad (6) \quad \checkmark$$

where  $\chi$  is an 8-component nucleon wave function. The formalism based on this equation predicts many of the properties of the particles which can be described by it. It is possible that these particles are in fact nucleons. There are 9 references: 3 Soviet;

~~card 1/2~~ *Moscow Inst. for Petrological & Gas Industries and I.M. Gukin*

LEBEDEV, V.V.; ADONIN, A.N.; GABRIYELOV, L.V.

Problems in using gas anchors. Trudy KF VNII no.5:92-104 '61.  
(MIRA 14:10)  
(Oil wells--Equipment and supplies)

ADONIN, A.N.; LEBEDEV, V.V.

Some problems of gas separation at the intake of a deep well pump.  
Trudy KF VNII no.5:105-116 '61. (MIRA 14:10)  
(Gas, Natural--Separation)

LEBEDEV, V.V.; GAVRILOVA, A.A.

Kinetics of hydrogen production on iron oxides based on the use of  
solid fuels. Trudy IGI 16:307-314 '61. (MIRA 16:7)  
(Hydrogen) (Iron oxides) (Fuel)

LEBEDEV, V.V.; GAVRILOVA, A.A.

Kinetics of the reduction of iron oxides with carbon. Trudy IGI  
16:295-300 '61. (MIRA 16:7)

(Iron oxides) (Carbon)

LEBEDEV, V.V.; GAVRILOVA, A.A.

Kinetics of the formation of hydrogen from water on iron. Trudy  
IGI 16:301-306 '61. (MIRA 16:7)  
(Hydrogen) (Iron oxides) (Steam)

LEBEDEV, V.V.; POLYAKOVA, V.N.

Production of synthesis gas from methane on metallic oxides. Trudy  
IGI 16:46-50 '61. (MIRA 16:7)  
(Methane) (Gas as fuel) (Metallic oxides)

LEBEDEV, V.V.

Prospects for pumping large quantities of viscous petroleum with  
a deep well pump. Trudy KF VNII no.11:153-158 '62.

Foaming in oil wells. 197-207

(MIRA 17:3)



LEBEDEV., V. V.,

Sutures

Primary suture of tendons in digital and wrist flexors. Uch. zap. Vt. mosk. med. inst. 2, 1951.

9. Monthly List of Russian Accessions, Library of Congress, April 195<sup>2</sup><sub>3</sub>, Uncl.

LEBEDEV, V. V.

Dissertation: "Change in the Protein Content of the Cerebrospinal Fluid and Blood Serum of Patients With Craniocerebral Trauma in the Acute Stage." Card Med Sci, Second Moscow State Medical Inst imeni I. V. Stalin, Moscow, 28 Jun 54. (Meditsinskiy Rabotnik, Moscow, 18 Jun 54)

SO: SUM 318, 23 Dec. 1954

LEBMDIV, V.V. (Moskva)

Effect of artificial hibernation on certain functions of the  
organism in cerebrocranial injuries. Eksper.khir. 4 no.4:  
52-53 J1-Ag '59. (MIRA 12:11)  
(BRAIN wds. & inj)  
(HIBERNATION, ARTIFICIAL eff)

LEBEDEV, V.V. (Moskva)

Closed injury of abdominal organs. Fel'd i akush. 24 no.8:12-18  
Ag '59.

(MIRA 12:12)

(ABDOMEN--WOUNDS AND INJURIES)

LEBEDEV, V.V.; VELIKORETSKIY, D.A. (Moskva)

Contusions of the thoracic cavity and rib fractures. Fel'd.  
i akush. 25 no.3:15-21 Mr. '60. (MIRA 13:6)  
(CHEST---WOUNDS AND INJURIES) (RIBS---FRACTURE)

BAKULEV, A.N.; LEBEDEV, V.V.

Experiments in the surgical treatment of acute myocardial  
infarct. Klin.med. 38 no.1:48-55 Ja '60. (MIRA 13:10)  
(HEART—INFRACTION)

LEBEDEV, V.V. (Moskva, B.Stroganovskiy per. d.5/36,kv.6)

Heart wounds and their surgical treatment. Grud. khir. 1 no.5:  
115-126 S-0 '61. (MIRA 15:3)

1. Iz Instituta grudnoy khirurgii AMN SSSR (dir. - prof.  
A.A. Busalov).

(HEART--WOUNDS AND INJURIES)

BAKULEV, A.N.; LEBEDEV, V.V. (Moskva, ul. Shchukinskaya-Novaya, d. 11, kv. 25)

Surgical treatment of myocardial infarct in the acute stage.  
Grud. khir. 3 no. 1:3-8 Ja-F '61. (MIRA 16:5)

1. Iz Instituta grudnoy khirurgii (dir. - prof. S.A. Kolesnikov)  
AMN SSSR.

(HEART—INFARCTION) (HEART—SURGERY)



BOGOLEPOV, N. K.; LEBEDEV, V. V.; SHAPIRO, L. B. (Moskva)

Indices for the early hospitalization and moving of patients  
with cerebral insults. Vrach. delo no.7:10-14, J1 '62.  
(MIRA 15:7)

1. Klinika nervnykh bolezney (zav. - prof. N. K. Bogolepov)  
Vtorogo meditsinskogo instituta imeni N. I. Pirogova, neyro-  
khirurgicheskoye otdeleniye, travmatologicheskaya klinika (zav. -  
prof. I. I. Sokolov) Instituta imeni N. V. Sklifosovskogo, Mos-  
kovskaya stantsiya skoroy pomoshchi.

(APOPLEXY)

LEBEDEV, V.V.

Surgical treatment of cerebral insultus. Zhur.nevr.i psikh. 62  
no.8:1160-1166 Ag '62. (MIRA 15:12)

1. Neyrokhirurgicheskoye otdeleniye (zav. V.V.Lebedev)  
travmatologicheskoy kliniki (zav. - prof. I.I.Sokolov) Instituta  
imeni N.V.Sklifosovskogo (glavnyy khirurg - prof. B.A.Petrov) i  
klinika nervnykh bolezney II Moskovskogo meditsinskogo instituta  
(zav. kafedroy - prof. N.K.Bogolepov) imeni Pirogova.  
(APOPLEXY)

LEBEDEV, V. V., kand. med. nauk; ISAKOV, Yu. V. (Moskva)

Gaseous composition of the blood in severe craniocerebral trauma.  
Vop. neirokhirurgii no.3:19-23 '62. (MIRA 137)

1. 1-ya khirurgicheskaya klinika instituta imeni Sklifosovskogo  
i klinika obshchey khirurgii II Moskovskogo meditsinskogo insti-  
tuta imeni N. I. Pirogova.

(BRAIN—WOUNDS AND INJURIES) (BLOOD, GASES IN)  
(SKULL—WOUNDS AND INJURIES)

LEBEDEV, V.V.; ISAKOV, Yu.V.; POKROVSKIY, G.A.

Shock as a result of craniocerebral injuries. Vop. neirokhir. 2<sup>o</sup>  
no.6:1-6 M-D '64. (MIRA 18:4)

1. Ordena Trudovogo Krasnogo Znameni nauchno-issledovatel'skiy  
institut skoroy pomoshchi imeni Sklifosovskogo, Moskva.

LEBEDEV, V.V.

Method for the quantitative determination of carbon tetra-  
chloride in the intestinal juice. Gig. i san. 28 no. 6:55-56  
Je<sup>1</sup>63 (MIRA 17:4)

1. Iz Yakutskogo gosudarstvennogo universiteta.

LEBEDEV, V.V., starshiy nauchnyy sotrudnik; ISAKOV, Yu.V., kand. med. nauk

Some problems of diagnosis and surgical treatment of acute cranio-cerebral traumas based on materials of the Sklifosovskii Institute. Trudy Inst. im. N.V. Sklif. 8:5-11 '63. (MIRA 18:6)

1. Institut skoroy pomoshchi imeni Sklifosovskogo, Moskva.

LEBEDEV, V.V.

Diagnosis and treatment of epidural hematomas. Khir. nevr.  
i psikh. 64 no.8:1145-1150 '64. (MIRA 17:12)

1. Institut skoroy i neotlozhnoy pomoshchi im. N.V. Sklifosovskogo  
(glavnyy khirurg - prof. B.A. Petrov) i klinika nervnykh bolezney  
II Moskovskogo meditsinskogo instituta (zaveduyushchiy - prof.  
N.K. Bogolepov).

LEBEDEV, V.V., kand. med. nauk

Acute traumatic epidural hematoma. Trudy Inst. im. N.V. Sklif.  
8:21-26 '63. (MIRA 18:6)

1. Institut skoroy pomoshchi imeni Sklifosovskogo, Moskva.



L 23268-66 FBD/EWT(1)/EWT(m)/EEC(k)-2/T/EWP(t)/EWP(k)/EWA(h) IJP(c) WG/TD  
ACC NR: AP6011569 SOURCE CODE: UR/0051/66/020/003/0501/0503

AUTHOR: Lebedeva, V. V.; Odintsov, A. I.; Lebedev, I. V.; Andriyakhin, V. M.;  
Gudovich, E. S.; Ponomareva, I. P.

ORG: none

TITLE: An He—Ne laser amplifier with feedback

SOURCE: Optika i spektroskopiya, v. 20, no. 3, 1966, 501-503

TOPIC TAGS: laser system, gas laser, helium neon laser, laser amplifier, feedback laser

ABSTRACT: An He—Ne laser amplifier with feedback (at  $\lambda = 0.633 \mu$ ) is described and illustrated (see Fig. 1). Master oscillator 1 and amplifier 2 are placed parallel to

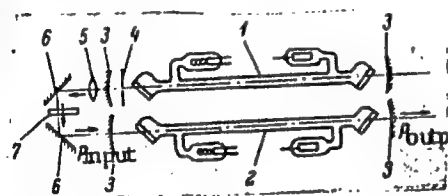


Fig. 1. Schematic of the device

1 - Master oscillator; 2 - amplifier; 3 - resonator mirror, radius of curvature 1160 mm; 4 - diaphragm for separating TEM<sub>00</sub> modes; 5 - coincidence lens; 6 - rotating mirrors; 7 - light filter.

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UDC: 621.375.9:535

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ACC NR: AP6011569

each other on a heavy bench. Radiation from 1 is attenuated by neutral filters by  $10^4$  or  $10^3$  times to provide a bypass from 1 to 2 and to avoid amplifier saturation. Lens 5 is used to produce coincidence of the wavefront, incident on 2, with the input mirror surface. The ratio of partial pressures of He and Ne in the amplifier is 17:1, resulting in a weak dependence of gain and activity of the medium on variations in the discharge current. The maximum gain of the system, measured in terms of the magnitude of the output signal from the amplifier when the oscillator frequency and the center of the amplifier passband are coincident, is 1000 (30 db). The misalignment of the amplifier axis with the direction of the incident wave, which affects gain, was not more than 3 sec of arc. The values of gain observed experimentally (mirrors: 99 and 98% reflective) and theoretically (mirrors: ideal dielectric) are in good agreement. Orig. art. has: 1 formula and 3 figures. [YK]

SUB CODE: 20/ SUBM DATE: 06Jul65/ ORIG REF: 003/ OTH REF: 003/ ATD PRESS: 4230

Card 2/2 *up*

LEBEDEV, V.V.; IOFFE, Yu.S.; CHETVERUSHKIN, B.V.

Treatment of skull traumas accompanied by injuries of the  
venous sinuses of the dura mater. Trudy Inst. im. N.V.  
Sklif. 8:54-57 '63. (MIRA 18:6)

1. Institut skoroy pomoshchi imeni Sklifosovskogo, Moskva.

LEBEDEV, V.V., starshiy nauchnyy sotrudnik; ISAKOV, Yu.V., kand. med. nauk

Cases in the blood in pathology of central respiratory regulation  
in patients with serious craniocerebral traumas. Trudy Inst. im.  
N.V. Sklif. 8:99-103 '63. (MIRA 12:6)

1. Institut skoroy pomoshchi imeni Sklifosovskogo, Moskva.

LEBEDEV, V.V.; ZHILIS, B.G.; CHETVERUSHKIN, B.V.

Anesthesia in surgery on craniocerebral traumas. Trudy Inst.  
im. N.V. Sklif. 9:222-225 '63. (MIRA 18:6)

1. Moskovskiy gorodskoy nauchno-issledovatel'skiy institut  
skoroy pomoshchi imeni Sklifosovskogo.

LEBENOV, V.V.; POLIANIKER, R.Y.; SHIRSHENKO, N.F.

New developments in supplying buildings under construction with materials and equipment. Vych. i org.tekh. v stroi. i proekt. (MIRA 18:10)  
no. 2:21-26 '64.

1. Gosudarstvennyy institut tipovogo i eksperimental'nogo  
proyektirovaniya i tekhnicheskikh issledovaniy Gosstroya SSSR.

LEBEDEV, V.Ya., Inzhn. RYISKIY, Ye.B., inzhn.

Distance-type measurement of the water level in a floating tower.  
Energetik. 13 no.1114-15 in '65.

(MIRA 12:8)

1. Teploelektrotsentral' No.2. Chelyabinsk.

KOROLEV, N.P., inzh.; LEBEDEV, V.Ye., inzh.

Welding objects made of the AMg5B alloy on the MTP-75 machine  
with a voltage booster. Svar. proizv. no.4:36-37 Ap '65.  
(MIRA 18:6)



LEEDEV, V. Ye.

"Investigation and Calculation of the Freely Supporting Grate With Wall  
Matrices of a Macaroni Press." Sub 18 Apr 51, Moscow Technological  
Inst of Food Industry

Dissertations presented for science and engineering degrees in Moscow  
during 1951.

SO: Sum. No. 480, 9 May 55

ROGASH, A.R., otv. red.; ABRAMOV, N.G., red.; KONDRASHUK, P.K.,  
red.; DUDAREV, Ye.I., kand. sel'khoz. nauk, red.;  
LEBEDEV, Ya.A., kand. sel'khoz. nauk, red.; LISTVIN,  
K.S., kand. sel'khoz. nauk, red.; LAPSHINA, O.V., red.

[New facts in fiber plant cultivation; from the trans-  
actions of the All-Union Scientific Research Institute on  
Flax] Novoe v kul'ture l'na-dolguntsa; iz trudov Vsesoiuz-  
nogo nauchno-issledovatel'skogo instituta l'na. Moskva,  
Kolos, 1965. 230 p. (MIRA 18:8)

1. Torzhok. Vsesoyuznyy nauchno-issledovatel'skiy institut  
l'na.

LEBEDEV, Ya. A.

USSR/Cultivation of Flax - Commercial. Oil-Dressing. Sugar-Dressing. 1.

Abs Jour : Ref Zhur - Zhel., No 10, 1950, 44216

Author : Lebedev, Ya.A.

Inst : -

Title : Once more on the Separate Harvesting of Flax.

Orig Pub : Len i konoplya, 1957, No 12, 13-19.

Abstract : No abstract.

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BOLOTOV, I.N., KOZYREVA, A.A.; KONDRASHUK, P.K.; KRYLOV, A.A.; TOLKOVSKIY,  
V.A.; KHAYLIS, G.A., Prinimal uchastiye LEBEDEV, Ya.A.;  
GOLOMYSOV, F.S., red.; BARANOVA, L.G., tekhn. red.; FRIDMAN,  
Z.L., tekhn. red.

[Over-all mechanization of flax growing] Kompleksnaya mekhaniza-  
tsiya l'novodstva. [By] I.N. Bolotov i dr. Leningrad, Sotrud-  
izdat, 1962. 354 p. (MIRA 16:2)  
(Flax processing machinery)

ABROSIMOV, Ye.V.; ORLOV, V.I.; LUZGIN, V.P.; LEBEDEV, Ya.I.; DASHEVSKIY,  
Yu.A.

Improving the surface of chromium-nickel-molybdenum steel sheet  
ignota. Stal' 22 no.12:1086 D '62. (MIRA 15:12)  
(Chromium-nickel-molybdenum alloys) (Steel ingota)

LEBEDEV, Ya. I., NOSOV, G. I., NEYLAND, K. K., VERGAZOV, N. G., KSENEFONTOV, V. F.

"Melting Chromium-Molybdenum-Nickel Steel in a 350-Ton Basic Open-Hearth Furnace," Stal', No.6, pp. 459-466, 1946

valuation B-61757

LEBEDEV, Ya. I., NOSOV, G. I., NEYLAND, K. K., BEZDENEZHNYKH, A. A., and KSENEFONTOV, V. F.

"Utilization of Alloy Scrap at Magnitogorsk Combine," Stal', No.6, pp. 10-18, 1946

Evaluation B-60428

S/133/62/000/012/002/012  
A054/A127

AUTHORS: Abrosimov, Ye.V., Orlov, V.I., Iuzgin, V.P., Lebedev, Ya.I., Dashev-  
skiy, Yu.A.

TITLE:

Improving the surface of chrome-nickel-molybdenum steel sheet slabs

PERIODICAL:

Stal', no. 12, 1962, 1,086

TEXT:

9.3-ton top-poured chrome-nickel-molybdenum slabs frequently have surface defects (of 467 test slabs 215 showed transversal cracks and 194 had scales). Several methods were tested to improve the slab surface; one of them involved reduction of the partial oxygen pressure in the ingot mold by adding nitrogen at a pressure of 3 - 6 atm, which, however, did not improve the surface quality. The best results were obtained with pouring through intermediate spouts, 30 and 35 mm in diameter (to reduce the impact of the metal jet) into molds with double lacquer coating. In such molds an intensive gassing takes place, which prevents the sputtering metal and the creasing surface skin from sticking to the mold walls. This gassing also produces a reducing mold atmosphere, preventing oxidation. Favorable results were also obtained in some cases with a glass cloth

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Improving the surface of chrome-nickel-molybdenum .... S/133/62/000/012/002/012  
A054/A127

fixed on the broad ingot mold side, which floats on the metal surface, and being lifted with the metal level, passes over into the slag, entraining metal drops deposited on it. The 0.29 mm thick cloth was glued into strips 2.2 - 2.5 mm thick by liquid glass. It should be considered that steels containing up to 2.5% chromium can be poured through a 30-mm spout only if heated to 1,630 - 1,640°C before reduction and if their ductility is decreased by reducing the aluminum added to the ladle to 150 g/ton.

Card 2/2

LEBEDEV, Ye.I.; RESHINA, I.I.; SAKIN, I.L.

Attachment to infrared spectrometers. Zav.lab. 29 no.8:1000-1002  
(MIRA 16:9)

'63.

(Spectrometer)

L 45135-66 EWT(m)/EWP(w)/T/EWP(t)/ETT IJP(c) JD

ACC NR: AP6019765

SOURCE CODE: UR/0370/66/000/003/0003/001b

AUTHOR: Kravchenko, V. F. (Moscow); Isakov, I. V. (Moscow); Khlebnikov, A. Ye. (Moscow); Dashevskiy, Yu. A. (Moscow);  
Lebedev, Ya. I. (Moscow); Selivanov, N. M. (Moscow)

ORG: none

TITLE: Improving the quality of open hearth steel by treating it with rare earth metal alloys

SOURCE: AN SSSR. Izvestiya. Metally, no. 3, 1966, 3-18

TOPIC TAGS: rare earth metal, metallurgic process, metal physics, metal property, steel property, mechanical property, steel / 40Kh2NMA steel

ABSTRACT: There is very little published information concerning the effect of rare earth metals (REM) on the properties of steel, and on the optimum conditions for the use of such metals. This paper investigates the effects of REM on specific properties of steel, notes procedures for alloying steel, and indicates optimum REM content to achieve desired combinations of mechanical properties. Chemical thermodynamic data and composition of REM alloys are presented in order to provide a better understanding of the principles involved in alloying steel with REM. Experimental melts were produced in a 150 ton induction furnace as well as in 25 and 200 ton basic open hearth furnaces. Mishmetal, a rare earth alloy containing 56.1% Ce and 41.3% La (other REM, iron, and impurities totaled 2.6%), was used as the deoxidizing agent. Studies were made of both cast and wrought metal states and tables of mechanical properties are in-

UDC: 669.141.243.4

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L 45435-66

ACC NR:AP6019765

cluded. The impact strength of steel 40Kh2NMa, melted in a 25 ton furnace and top-poured at 1580°C, is given. Results of the experiments showed that in all cases the addition of REM increased steel ductility. This increase was greatest when the mishmetal was able to reduce sulfur content in the solidified ingot. Desulfurization was best accomplished when it was initiated in the ladle prior to pouring into the mold. Optimum conditions were concluded to be ladle deoxidation and desulfurization by adding 0.15-0.20% mishmetal (calculated) to the molten steel (1560-1580°C) immediately after tapping from the furnace. The mishmetal reaction begins and most of the sulfur is removed by the time the steel is poured and solidified. The procedure lowers the sulfur content 25 to 30%. The mishmetal significantly reduces nonmetallic inclusion content, as well as changing the shape, composition, and distribution of that content. Finally, the REM alloy increases impact strength of the rolled steel 27 to 47% (transverse test samples) and of cast steel by 47 to 65%, with a simultaneous increase in ductility. Orig. art. has: 12 tables and 6 figures.

SUB CODE: 11/

SUBM DATE: 25 May 64 / ORIG REF: 026 / OTH REF: 001

LS

Card 2/2

TSVETKOV, Yu.D.; LEBEDEV, Ya.S.; VOYEVODSKIY, V.V.

Free radical reactions in irradiated polytetrafluoroethylene.  
Part 1: Use of electron resonance (ER) in studying radical conversions and in the determination of the coefficient of diffusion of oxygen in polytetrafluoroethylene. Vysokom. soed. 1 no.10:1519-1525 0 '59. (MIRA 13:3)

1. Institut khimicheskoy fiziki AN SSSR.  
(Radicals(chemistry)) (Ethylene) (Oxygen)

TSVETKOV, Yu.D.; LEBEDEV, Ya.S.; VOYEVODSKIY, V.V.

Reactions of free radicals in irradiated polytetrafluoroethylene.

Part 2: Determination of the rate constants for the reactions

$RO_2 \rightarrow R + O_2$  and  $R + O_2 \rightarrow RO_2$ . Vysokom.sped. 1 no.11:1634-1642  
N '59. (MIRA 13:5)

1. Institut khimicheskoy fiziki AN SSSR.

(Radicals (Chemistry) (Ethylene) (Oxygen)

LEBEDEV, Ya. S.  
~~LATYSEV, G. D.~~

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PHASE I BOOK EXPLOITATION SOV/5410

Tashkentskaya konferentsiya po mirnomu ispol'zovaniyu atomnoy energii, Tashkent, 1959.

Trudy (Transactions of the Tashkent Conference on the Peaceful Uses of Atomic Energy) v. 2. Tashkent, Izd-vo AN UzSSR, 1960. 449 p. Errata slip inserted. 1,500 copies printed.

Sponsoring Agency: Akademiya nauk Uzbekskoy SSR.

Responsible Ed.: S. V. Starodubtsev, Academician, Academy of Sciences Uzbek SSR. Editorial Board: A. A. Abdullayev, Candidate of Physics and Mathematics; D. M. Abdurazulov, Doctor of Medical Sciences; U. A. Arifov, Academician, Academy of Sciences Uzbek SSR; A. A. Borodulina, Candidate of Biological Sciences; V. N. Ivashev; G. S. Ikramova; A. Ye. Kiv; Ye. N. Lebanov, Candidate of Physics and Mathematics; A. I. Nikolayev, Candidate of Medical Sciences; D. Nishanov, Candidate of Chemical Sciences; A. S. Sadykov, Corresponding Member, Academy of Sciences USSR, Academician, Academy of Sciences Uzbek SSR; Yu. N. Talanin,

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Transactions of the Tashkent (Cont.)

SOV/5410

Candidate of Physics and Mathematics; Ya. Kh. Turakulov, Doctor of Biological Sciences. Ed.: R. I. Khamidov; Tech. Ed.: A. G. Babakhanova.

PURPOSE : The publication is intended for scientific workers and specialists employed in enterprises where radioactive isotopes and nuclear radiation are used for research in chemical, geological, and technological fields.

COVERAGE: This collection of 133 articles represents the second volume of the Transactions of the Tashkent Conference on the Peaceful Uses of Atomic Energy. The individual articles deal with a wide range of problems in the field of nuclear radiation, including: production and chemical analysis of radioactive isotopes; investigation of the kinetics of chemical reactions by means of isotopes; application of spectral analysis for the manufacturing of radioactive preparations; radioactive methods for determining the content of elements in the rocks; and an analysis of methods for obtaining pure substances. Certain

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Transactions of the Tashkent (Cont.)

SOV/5410

instruments used, such as automatic regulators, flowmeters, level gauges, and high-sensitivity gamma-relays, are described. No personalities are mentioned. References follow individual articles.

TABLE OF CONTENTS:

RADIOACTIVE ISOTOPES AND NUCLEAR RADIATION  
IN ENGINEERING AND GEOLOGY

Lobanov, Ye. M. [Institut yadernoy fiziki UzSSR - Institute of Nuclear Physics AS UzSSR]. Application of Radioactive Isotopes and Nuclear Radiation in Uzbekistan

7

Taksar, I. M., and V. A. Yanushkovskiy [Institut fiziki AN Latv SSR - Institute of Physics AS Latvian SSR]. Problems of the Typification of Automatic-Control Apparatus Based on the Use of Radioactive Isotopes

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Transactions of the Tashkent (Cont.)

SOV/5410

Ethylene Irradiated by High-Speed Electrons

430

Troshkov, Yu. D., Ya. S. Lobedov, and V. V. Vovvedskiy [Institute of Chemical Physics AS USSR]. Investigation of the Reactions of Free Radicals in Irradiated Teflon

431

Markovich, S. V., and A. A. Ivko [Institute of Physical Organic Chemistry AS BelSSR]. Deuterium Exchange on Solid Surfaces in the Gas Phase. Deuterium Exchange in Ethylene on an Industrial Aluminosilicate Catalyst

440

AVAILABLE: Library of Congress

Card 20/20

JA/rsm/jw  
11-3-61

5. 3832

(2209)

88358

S/195/60/001/004/002/015

B017/B055

AUTHORS: Lebedev, Ya. S., Tavetkov, Yu. D., Voyevodskiy, V. V.

TITLE: The Origin of the Compensation Effect in Recombination Reactions of Radicals in Irradiated Polymers .

PERIODICAL: Kinetika i kataliz, 1960, Vol. 1, No. 4, pp. 496-502

TEXT: The authors studied the rate constants of the recombination reactions of radicals in hydrocarbon polymerizates, polyvinyl chloride and various Teflon samples. Log  $k^0$  in irradiated polymers was found to be a linear function of the activation energy E. Table 1 gives values of  $k^0$  and E for radical recombination in various polymers. This recombination is generally observed at temperatures around the melting point of the polymer. Within the melting range, the activation energy was found to decrease with an increase in temperature. Basing on the equation  $k = k_0 \exp [-E(T)/RT]$ , the authors calculated E and  $k^0$  from the relations

$$E_{\text{eff}} = E - T \partial E / \partial T \quad (1) \text{ and}$$

$$k_{\text{eff}}^0 = k^0 \exp(-(1/R) \partial E / \partial T) \quad (2).$$

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The Origin of the Compensation Effect in  
Recombination Reactions of Radicals in  
Irradiated Polymers

88358  
S/195/60/001/004/002/015  
B017/B055

The true values of  $k^0$  for the recombination of fluoroalkyl radicals in Teflon are shown in Table 2. They are of the order of  $10^{-9}$  -  $10^{-16}$  cm<sup>3</sup>/sec. The true value of E is of the order of 10-20 kcal/mole. The assumed temperature dependence of the activation energy of radical recombination in Teflon is represented graphically in Fig. 2. The anomalous values of  $k^0$  are ascribed not only to the occurrence of phase changes on temperature increase, but also to factors due to condensation of phases. S. Z. Roginskiy and Yu. L. Khait are mentioned. There are 2 figures, 2 tables, and 14 references: 9 Soviet, 4 US, and 1 Polish.

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR (Institute of Chemical Physics of the AS USSR). Institut khimicheskoy kinetiki i gorennya CO AN SSSR (Institute of Chemical Kinetics and Combustion of CO of the AS USSR)

SUBMITTED: July 27, 1960

Card 2/2

21.6000

5.3100

S/051/60/008/06/010/021  
R201/R691

AUTHORS: Lebedev, Ya.S., Tavetkov, Yu.D., and Voyevodskiy, V.V.

TITLE: The Electron Paramagnetic Resonance Spectra of Fluoroalkyl and Nitrosofluoroalkyl Radicals in Irradiated Teflon

PERIODICAL: Optika i spektroskopiya, 1960, Vol 8, Nr 6, pp 811-814 (USSR)

ABSTRACT: The authors describe their results obtained in an investigation of electron paramagnetic resonance (EPR) spectra of fluoroalkyl and nitrosofluoroalkyl radicals in irradiated teflon at temperatures up to 300°C. An EPR spectrometer with high-frequency (300 kc/s) magnetic-field modulation, described earlier (Ref 4), was used. The samples were heated by blowing hot air around them. The EPR spectrum of the fluoroalkyl radical exhibited additional hyperfine splitting of 3.5 oersteds at high temperatures. This splitting was due to the interaction of the unpaired electron with fluorine atoms in the  $\gamma$ -position (Fig 1 shows this at 250°C). These  $\gamma$ -components were broadened on cooling (Fig 2) so that at room temperature they could no longer be resolved. Fig 3 shows that on further lowering of temperature to about 16°C the  $\beta$ -components broaden as well and finally below 0°C the hyperfine splitting due to  $\alpha$ - and  $\beta$ -atoms of fluorine

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E201/E691

The Electron Paramagnetic Resonance Spectra of Fluoroalkyl and Nitrosofluoroalkyl Radicals in Irradiated Teflon

disappears completely. Gordy (Ref 2) reported that the EPR spectrum of fluoroalkyl radical disappeared on interaction with NO. The present authors found that simultaneously with the disappearance of the original fluoroalkyl spectra a new complex EPR spectrum appears (Fig 4). This new spectrum is ascribed to the nitrosofluoroalkyl radical and its profile at 150°C (Fig 4a) agrees with theoretical predictions (Fig 4b). Splittings in the EPR spectrum of nitrosofluoroalkyl suggest that the unpaired electron is localized mainly at the nitrogen nucleus. The paper ends with a short discussion of the results obtained and comparison with other published work. There are 5 figures and 11 references, of which 3 are Soviet and 8 English.

SUBMITTED: September 21, 1959

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S/081/62/000/005/007/112  
B158/B110

111510  
AUTHORS:

Buchachenko, A. L. Neyman, M. B. Lebedev, Ya. S.

TITLE:

Investigation of radical reactions of antioxidants in liquid phase by the method of electronic paramagnetic resonance

PERIODICAL:

Referativnyy zhurnal. Khimiya, no. 5, 1962, 59, abstract 5B360 (Tr. po khimii i khim. tekhnol. (Gor'kiy), no. 1, 1961, 39 - 43)

TEXT: By the method of electronic paramagnetic resonance it is shown that stable radicals are formed when a number of active radicals, obtained by decomposing benzoyl peroxide, cyclohexyl percarbonate, p-tert-butyl cumene peroxide, etc., in the presence of a catalyst, are reacted with antioxidants - aromatic amines, alkyl substitution phenols, naphthols, etc. Their lifetimes in a solution of toluene or benzene (in liquid phase) range from several minutes to several hours depending on the nature of the radicals and the temperature. For a number of antioxidants - phenols and amines - it was possible to identify the structures of the radicals formed and to study

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Investigation of radical reactions ...

S/081/62/000/005/007/112  
B158/B110

their conversions as well as formation mechanism. [Abstracter's note:  
Complete translation.]

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28974  
S/192/61/002/005/001/001  
D202/D304

AUTHORS: Buchachenko, A.I., Lebedev, Y.L.S. and Hargen, M.P.

TITLE: Investigating anti-oxidant radicals by means of  
electronic para-magnetic resonance  
I. Phenoxylradicals

PERIODICAL: Zhurnal strukturnoy khimii, v. 2, no. 5, 1961,  
558-561

TEXT: This experimental work is similar to that published by Becconsall and others in 1960, the difference between these two investigations lying in the use of active compounds, capable of splitting off hydrogen from the phenol. The Western scientists used lead peroxide and the Russians benzoyl peroxide, cyclohexyl percarbonate and p-tert-butylcumene hydroxy-peroxide with cobalt stearate to catalyze the decomposition. The authors state that the Western investigation was published when theirs

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Investigating anti-oxidant ...

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D202/DF04

was virtually finished. After briefly discussing the phenoxy-radicals theory, based on Western publications, the authors state that their object was to obtain stable phenoxy-radicals and to study their structure and life-span; it was found that the latter amounted to hours. Substituted phenols used in the present work are given in the Table together with the characteristics of their spectra. Experiments were carried out in sealed thin glass tubes in toluene solutions, with compounds in the ratio of 1:1; the tubes were heated to 50-80°C, put in the resonator of the EPR spectrometer and the first derivatives of absorption spectra recorded on a self-recording EPR-09 potentiometer. The equipment was previously described by A.G. Semenov and M.N. Bubnov (Ref. 5: Priory i tekhnika eksperimenta, 1, 92, 1959). The authors discuss in detail, the spectrum of 2,6-di-tert-butyl-4-methyl phenoxy radical, obtained by the action of benzoyl peroxide, cyclohexyl percarbonate or diphenyl-picryl hydrazine (DEPC); with the last component the formation of the phenoxy-

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Investigating anti-oxidant ,,,

S/192/1/10/100/100/100  
D202/0507

English-language publications read as follows: E. Kooyma, Y. Chem.Soc., 3217 (1953); D. Davila, Y. Chem.Soc., 4926 (1956); Ch. Walling, J. Amer. Chem. Soc., 80, 10, 10 (1958); Y.K. Beconsall, S. Clough, U. Scott, Y. Chem.Soc., 56, 459, (1960)

ASSOCIATION: Institut khimicheskoy fiziki, AS SSSR (Academy of Chemical Physics AS USSR)

SUBMITTED: July 14, 1960

Card 4/6  
4

z4, 7900

55310

28976

S/192/61/002/005/003/005  
D202/D304

AUTHORS: Lebedev, Ya.S. and Tsvetkov, Yu.D.  
TITLE: Electronic paramagnetic resonance spectra of  
radicals formed by irradiation of polypropylene  
PERIODICAL: Zhurnal strukturnoy khimii, v.2, no.5, 1961,  
607-609

TEXT: The authors give results of their study of free radicals found in poly-propylene (PP) by irradiation with  $\gamma$ -rays of  $\text{Co}^{60}$  or by the action of high-speed electrons, but do not describe the methods used. In their experiments, they used powdered  $\Pi\Pi$  (PP) samples, crystallized to various extents, the corresponding electronic paramagnetic resonance spectra  $\text{ЭПР}$  (EPR) being studied in different temperature conditions: at  $77^\circ\text{K}$ , at  $-78^\circ\text{C}$ , at  $25^\circ\text{C}$  after defreezing in vacuo and at  $40-60^\circ\text{C}$ . The EPR of PP in the temperature range  $77 - 195^\circ\text{K}$  has

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Electronic paramagnetic ...

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been studied previously. When the sample temperature is raised to 25°C the spectrum is changed, and consists of 15 lines which remain in the same position when the temperature is lowered again, although line broadening occurs; the radical content increasing with progressive crystallization. The authors assume that the 15 line spectrum consists of two superimposed spectra of 9 and 6 components with superfine structure, having the same splitting ( $\sim 20$  oer). Both spectra disappear at 40 - 60°C at equal rates. A further spectrum change is observed after 2 hours, in vacuo, at room temperature: the signal intensity gradually falling and a broad line ( $\sim 40$  oer) appearing in the center. By passing oxygen through the sample at room temperature, a peroxide line is obtained, but no effects are apparent if the oxygen is passed in after a few days. At least 4 different free radicals are believed to be present in spectra of the irradiated PP samples; after defreezing only the

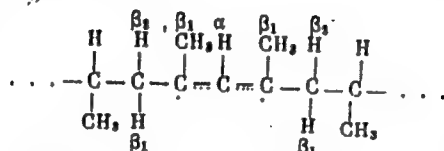
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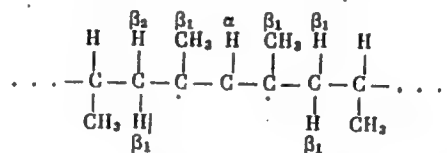
Electronic paramagnetic ...

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allyl radical



into account. Assuming that the spin density on the central C atom is small the splitting has to be observed on  $\beta_2$  protons, giving a spectrum of 9 components; the  $\beta_2$  protons being oriented in such a way that they cannot take part in it. The spectrum with an even number of lines may be explained by a small admixture of the radical  $R_3$



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Electronic paramagnetic ...

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and the appearance of a broad line after prolonged standing in vacuo as the formation of some unknown radicals, more stable, than the allyl. The authors also investigated oriented PP films; when the magnetic field was oriented along the macromolecular axes, the PP spectrum was similar to that of crystalline samples; when the direction of the field formed an angle ( $\theta$ ) with this axis, the line width became larger, reaching a maximum at  $\theta = \pi/2$ , but their number and position did not change. This angular EPR spectrum dependence is considered to be in agreement with the structure of the free allyl radical proposed in Western literature. The authors state that in 1961, when their paper was being printed, similar work was published in the West, the experimental results being the same, but being given a different interpretation. There are 1 figure and 5 references: 3 Soviet-bloc and 2 non-Soviet-bloc. [Abstracter's note: 1 Soviet-bloc reference is a translation from Western literature].

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Electronic paramagnetic ...

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S/192/61/002/005/003/005  
D202/D304

The references to the English-language publications read as follows: S. Ohnishi, M. Kashiwagi, J. Ikeda, N. Nitta, Isotopes and Radiazion (Japan), 1,210 (1958); H. Fisher, K.H. Hellwege, V. International Symposium on Free Radicals, Uppsala (Sweden), (1961).

ASSOCIATION: Institut khimicheskoy fiziki AN USSR. Institut khimicheskoy kinetiki i goreniya CO AN USSR (Institute of Chemical Physics AS USSR. Institute of Chemical Kinetics and CO Combustion AS USSR)

SUBMITTED: April 8, 1961

Card 5/5

30915  
S/192/61/002/006/002/004  
D228/D304

24,7900 (1055, 1144, 1163)

AUTHORS:

Lebedev, Ya. S., Chernikova, D. M., and Tikhomirova,  
N. N.

TITLE:

Computing the spectra of electron paramagnetic re-  
sonance on an electronic calculating machine. 1. EPR  
spectra with an ultrafine structure (symmetrical  
components)

PERIODICAL:

Zhurnal strukturnoy khimii, v. 2, no. 6, 1961,  
690-695

TEXT:

The authors computed theoretical EPR spectra with an  
ultrafine structure by means of a high-speed calculating machine at  
different ratios of individual component widths to the resolution  
magnitude. Special attention was paid to the area beneath the ab-  
sorption curve, the number of components and the intensity correla-  
tions, the line widths in the spectra, and the form of individual  
lines. Previous work shows that determining these parameters is

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Computing the spectra of ...

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impeded by the spectrum's distorted form, and that the line form can only be mathematically analyzed, when laborious calculations are necessary, in the simplest of cases-singlet and doublet lines. Graphs of theoretical spectra were plotted both for cases of equal component intensity and for those of the binomial distribution of intensities (1:2:1, 1:3:3:1, 1:4:6:4:1). The Gauss and Lorentz forms of individual component lines were calculated from the equation

$$I(x) = \sum_{k=1}^n a_k f \left[ \frac{x - k + 1}{\beta} \right]$$

where  $n$  = the number of UFS components,  $a_k$  = the coefficients of intensity,  $k$  = the ordinal number of UFS components,  $f(x) = (1 + 1.335x^2/\beta^2)^{-1}$  and  $\exp(-2x^2/\beta^2)$  for the Lorentz and Gauss

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Computing the spectra of ...

forms respectively,  $\beta = \Delta H_1 / \Delta H_r$ ;  $x = H - H_0 / \Delta H_r$ ,  $\Delta H_r$  = the resolution between the UFS components,  $\Delta H_1$  = the width of individual lines between the points of maximum inclination,  $H_0$  = the field corresponding to the center of the end component, and  $H$  = the magnetic field's alternating value. Two methods are proposed for examining experimental spectra: The direct comparison of observed and theoretical spectra, and the use of nomograms for analyzing unresolved EPR spectra. In the latter the true values of  $\beta = \Delta H_1 / \Delta H_r$  are plotted along the x-axis and  $\Delta H_s^2 / \Delta H_r$ ,  $\Delta H_1 / \Delta H_r$ ,  $\Delta H_{r(k-1)}^2 / \Delta H_r$ , and  $I'_k / I'_l$  along the y-axis;  $k$  and  $l$  are the component numbers,  $I'_k$  and  $I'_l$  being the amplitudes of components  $k$  and  $l$  recorded in a first derivative form. The combination of both methods allows the parameters of unresolved spectra to be determined with sufficient accuracy when both the spectrum structure and  $\Delta H_r$  are known, or when only one of these quantities is known. The desired parameters can apparently be evaluated even if there is absolutely no information about a partially

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Computing the spectra of ...

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resolved spectrum. Thus, the authors conclude that the foregoing procedure will enable different EPR spectra to be satisfactorily deciphered and processed which in turn will increase the possibility of applying the EPR method to solving scientific problems. Due to acknowledgement is made to V. V. Voyevodskiy, A. Ya. Povzner, and others on the staff of the Matematicheskii otdel IKhF AN SSSR Mathematics Section, Institute of Chemical Physics, Academy of Sciences USSR) for their advice and interest. There are figures, 1 table, and 10 references: 7 Soviet-bloc and 3 non-Soviet-bloc. The reference to the English-language publications read as follows: J. G. Powles et al, Proc. Phys. Soc. 77, 729 (1959). W. Gordy et al, Proc. Nat. Acad. Sci. USA 46, 1124 (1961); D. Libby et al, J. Phys. Chem. Solids 18, 316 (1961).

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR (Institute of Chemical Physics, AS USSR)

SUBMITTED: July 7, 1961

Card 4/4

S/190/61/003/006/013/019  
B110/B208

11.2214 dno 2209

AUTHORS:

Tsvetkov, Yu. D., Lebedev, Ya. S., Voyevodskiy, V. V.

TITLE:

Study of free radical reactions. III. Recombination of fluoroalkyl and peroxide radicals

PERIODICAL:

Vysokomolekulyarnyye soyedineniya, v. 3, no. 6, 1961, 882-890

TEXT: The purpose of the present paper is the investigation of the recombination reactions of fluoroalkyl and peroxide radicals under exclusion of oxygen diffusion. The dependence of the radical recombination on the ratio of the amorphous and crystalline phase was studied on Teflon with different degree of crystallinity. Teflon samples in the form of films or chips were irradiated by a  $\gamma\text{Co}^{60}$  radiation source at  $\sim 60$  Mrad. The free radical concentration is in this case  $\sim 10^{18}$   $1/\text{cm}^3$ . Polymerization took place on the oil bath, the electron paramagnetic resonance was studied at  $10^\circ\text{C}$  to determine the free radicals.

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Study of free radical reactions.  
III. Recombination of ...

S/190/61/003/006/013/019  
B110/B208

The kinetics of the recombination of the radicals  $\dot{R}$  and  $\dot{RO}_2$  was determined at different temperatures and degrees of crystallinity (74 and 46 %) (Fig. 1). The relative concentration  $I$  was referred to the initial concentration = 1:  $I_\alpha = [\dot{RO}_2]/[\dot{RO}_2]_0$ ,  $I_\beta = [R]/[R]_0$ . The reciprocal concentration as a function of time (Fig. 1) approaches linearity asymptotically corresponding to the bimolecular recombination reaction. In polymers with crystalline and amorphous phases (polyethylene, polypropylene, Teflon) recombination proceeds according to the bimolecular law with different rates in the amorphous and crystalline phase. Assuming that  $[\dot{R}]_{\text{cryst}} = c_1$ ;  $[\dot{R}]_{\text{am}} = c_2$  in the case of Teflon, the mean concentration  $c_{\text{mean}} = c_1\alpha + c_2(1 - \alpha)$ , where  $\alpha$  = degree of crystallinity.  $c_1$  and  $c_2$  depend on the time:  $\partial c_{1,2}/\partial t = -k_{1,2}c_{1,2}^2$  (2). According to  $\lim_{t \rightarrow 0} (1/I)$

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$= 1 + (1 - \alpha)k_2t$  initially a rectilinear section appears in the coordinates reciprocal concentration-time (Fig. 15, curve 1), which corresponds to the square recombination in the amorphous zone, as well as a section corresponding to the square recombination in the crystalline zone in the case of higher  $t$ -values. According to (2) the straight line corresponding to the recombination in the crystalline phase cuts off the section  $1/\alpha$  on the  $y$ -axis. The degree of crystallinity may thus be determined from the recombination kinetics. Table 1 gives the degrees of crystallinity calculated from the recombination kinetics  $\dot{R}O_2$  and  $\dot{R}$ , and the  $\alpha$ -values calculated from the specific weight (according to  $d = 2.00 + 0.31\alpha [g/cm^3]$ ). Their agreement confirms the model suggested and the equality of the initial combination in both phases. The different stability of the radicals in amorphous and crystalline phase is confirmed by their decrease in concentration by 25-50 % during

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primary heating of the irradiated samples to 150-200°C, and constancy of the concentration of repeated heating. According to (2), the rate constants of the recombination reactions at different temperatures and degrees of crystallinity can be determined from the linear anamorphisms of the kinetic curves of the type of Figs. 1, a and b. The recombination of fluoroalkyl radicals takes place in a measurable rate only at temperatures which are by 50-70°C higher than in the case of peroxide radicals. The following is written: peroxide radicals:

$$\begin{aligned} k_{rr}^{(46)} &\simeq 10^{-8} \cdot \exp \left\{ - \frac{26000 \pm 3000}{RT} \right\}; \\ k_{at}^{(46)} &\simeq 10^{-15} \cdot \exp \left\{ - \frac{12000 \pm 2000}{RT} \right\}. \end{aligned} \quad (A)$$

fluoroalkyl radicals:  $k_{kr}^{(46)} \simeq 10^{-3} \cdot \exp \left\{ - (40,000 \pm 4,000)/RT \right\}$   
 $k_{at}^{(46)} \simeq 10^{-7} \cdot \exp \left\{ - (30,000 \pm 3,000)/RT \right\}.$

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The activation energy of peroxide radical recombination is  $26 \pm 3$  kcal/mole in the crystalline phase,  $11 \pm 3$  kcal/mole in the amorphous phase. Values of 20 - 40 kcal/mole are obtained for primary alkyl radicals in various hydrocarbon polymers. The recombination of long-life radicals of solid polymers is not determined by their structure but by the properties of the medium: movement of the segments of polymer chains. In the amorphous phase with high chain mobility the recombination rate is determined by rotation of small chain parts. In the crystalline phase with firmly bound chains it is determined by the rotation of long chain parts. In the recombination rate of fluoroalkyl radicals the high values of the pre-exponential factors are remarkable, which have also been observed in other polymers (Table 2). The activation energy and the pre-exponential factor highly differ for various Teflon samples, which was also observable in many reactions of the solid phase and of the electric conductivity. The linear dependence  $\log k^0(E)$  existing in this case is called compensation dependence (Fig. 3). The potential barrier of the segment rotation of the polymer chain probably decreases with a rise in temperature, which

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explains the compensation dependence and the high pre-exponential factors, whose real values are  $10^{-8}$  and  $10^{-10}$  cm<sup>3</sup>/sec. The high values obtained experimentally are thus a result of the change in activation energy with temperature rise. The authors thank G. G. Titova for her assistance in some experiments. There are 3 figures, 2 tables, and 13 references: 8 Soviet-bloc and 4 non-Soviet-bloc. The most important references to English-language publications read as follows: Ref. 4: S. Ohnishi, I. Nitta, J. Polymer Sci., 38, 451, 1959. Ref. 5: Z. Kuri, H. Ueda, S. Shida, J. Chem. Phys., 32, 371, 1960. Ref. 7: J. A. Sauer, A. E. Woodward, Rev. Mod. Phys., 32, 88, 1960.

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR (Institute of Chemical Physics AS USSR).  
Institut khimicheskoy kinetiki i goreniya CO AN SSSR (Institute of Chemical Kinetics and Combustion of the Siberian Division AS USSR)

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28654

S/020/61/139/006/021/022

B103/B101

11.1510

5.5450

AUTHORS: Lebedev, Ya. S., Tsepalov, V. F., and Shlyapintokh, V. Ya.

TITLE: The possibility of using the method of electron paramagnetic resonance to record the active centers in the oxidation of hydrocarbons in the liquid phase

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 139, no. 6, 1961, 1409-1412

TEXT: The authors studied the applicability of electron paramagnetic resonance (epr): a) for determining free radicals; b) for measuring the steady concentration of these radicals in the oxidation of hydrocarbons. A continuation of these studies will probably contribute to the knowledge of the kinetics of processes of other types. From the measured values it is possible to determine directly the rate constants of the elementary reactions that constitute parts of the entire process. Since the concentration of the radicals is low, their determination under steady conditions is difficult. For this reason the active radicals could not be identified during the oxidation of hydrocarbons in the liquid phase. 2 types of active centers take part in the oxidation of hydrocarbons:

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hydrocarbon radicals  $\dot{R}$  and peroxide radicals  $\dot{RO}_2$ . At a given initiation rate the steady concentration is known for several substances. It is approximately equal for the following substances: cyclohexene, methyl cyclohexene, 1-octene, dihydromyrcene, ethyl linoleate, digeranyl, tetralin, ethyl benzene, cumene, n-decanal, and benzaldehyde. Under

steady conditions:  $\frac{d(\dot{RO}_2)}{dt} = 0$ , and  $(\dot{RO}_2) = \sqrt{\frac{w_i}{k_6}}$  (1). Hence, the steady

concentration of the  $\dot{RO}_2$ , at a given initiation rate, is the higher the lower the rate constant of  $\dot{RO}_2$  recombination. An increase of the constant to the threefold increases the steady concentration only to the 1.7-fold. In aromatic hydrocarbons, tetralin and ethyl benzene, in which the peroxide group is located at a secondary hydrocarbon atom, the recombination constant is by 1-2 orders of magnitude higher. Among the substances mentioned the cumyl peroxide radicals recombine with the smallest constant. In order to prove the existence of the peroxide radicals their concentration must amount to at least  $1 \cdot 10^{15}$  to  $5 \cdot 10^{15}$  radicals/cm<sup>3</sup>. The authors studied

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cumene since they expected the highest concentration in this substance. They used an epr-spectrometer MXQ-2 (IKhF-2) with high-frequency modulation of the magnetic field (A. G. Semenov, N. N. Bubnov, PTE, 1, 92 (1959)). During the oxidation, oxygen was continuously bubbled through the hydrocarbon. The following substances were used for the oxidation: I) azobisisobutyronitrile, II) dicyclohexyl percarbonate, III) cobalt stearate, and IV) cobalt acetate. Different initiators give identical spectra. The spectrum is a wide, almost symmetrical singlet ( $\Delta H \approx 18 \pm 2$  oersteds) with a g factor of  $2.015 \pm 0.001$ . According to the shift of the g factor and the effective line width, this spectrum is similar to the epr spectrum of the peroxide radicals in the solid phase. In control tests in which isopropyl benzene was replaced by ethyl benzene no epr spectrum was observed in any of the initiators mentioned. Besides, epr absorption disappeared when the oxygen supply was stopped and when nitrogen was blown through for a short period. Ad I) The authors calculated the steady concentrations of the cumyl peroxide radicals at different initiation rates from the known values  $w_1$  and  $k_6$  of Eq. (1). These concentrations were also measured between 70 and 90°C and a

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concentration of I) between 0.05 and 0.55 mole/l. The absolute values of the concentrations of  $(\dot{R}O_2)_{meas}$  lie between  $2 \cdot 10^{15}$  and  $4 \cdot 10^{16}$  radicals/cm<sup>3</sup>. The measured steady concentration of  $RO_2$  radicals was close to the calculated one. In experiments with II) the authors measured concentrations of  $4 \cdot 10^{15}$  to  $2 \cdot 10^{16}$  radicals/cm<sup>3</sup>. The rate constant of decay of II) into radicals is unknown. The authors assume that its decay rate is equal to the decay rate into radicals. Thus, they calculate the initiation rate and find that the measured concentrations of the  $RO_2$  radicals are 1/4 to 1/2 of the calculated values. Since this rate is unknown in experiments with III) and IV) the measured and calculated radical concentrations could not be intercompared. There are 2 figures, 1 table, and 11 references: 4 Soviet and 7 non-Soviet. The four most important references to English-language publications read as follows: Ref. 1: H. W. Melville, S. Richards, J. Chem. Soc. 1954, 944; Ref. 4: H. R. Cooper, H. W. Melville, J. Chem. Soc., 1951, 1993; Ref. 5: L. Bateman, G. Gee, Trans. Farad. Soc., 47, 155 (1951); Ref. 6: T. A. Ingles, H. W. Melville, Proc. Roy. Soc., A218, 163 (1953).

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The possibility of using the method...

ASSOCIATION: Institut khimicheskoy fiziki Akademii nauk SSSR (Institute  
of Chemical Physics of the Academy of Sciences USSR)

PRESENTED: May 20, 1961, by V. N. Kondrat'yev, Academician

SUBMITTED: May 20, 1961

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LEBEDEV, Ya.S.; TSVETKOV, Yu.D.; ZHIDOMIROV, G.M.

Analysis of asymmetrical lines in electron paramagnetic resonance spectra as a method of studying internal movements in polymers.  
Zhur.strukt.khim. 3 no.1:21-27 Ja-F '62. (MIRA 15:3)

1. Institut khimicheskoy fiziki AN SSSR i Institut khimicheskoy kinetiki i goreniya Sibirskogo otdeleniya AN SSSR.  
(Polymers—Spectra)

S/844/62/000/000/089/129  
D204/D307

AUTHORS: Tscvetkov, Yu. D., Lebedev, Ya. S. and Voyevodskiy, V. V.  
TITLE: A study of radical recombinations in irradiated teflon  
SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khimii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962, 521-525

TEXT: The kinetics were studied of the recombinations of fluoroalkyl ( $\dot{R}$ ) and peroxide ( $RO_2$ ) radicals, formed when polytetrafluoroethylene (teflon) is irradiated with  $\gamma$  rays, in vacuum or under  $O_2$ , as this field is as yet incompletely explored. EPR spectroscopy was employed to follow the reactions in specimens in which the degree of crystallinity,  $\alpha$ , was 46 or 74%. The reactions were always of the 2nd order, but the velocity constants ( $k^0$ ) depended on  $\alpha$ . Thus for  $\dot{R}$  radicals, with  $\alpha = 74\%$ ,  $k^0 = 10^6$ , and with  $\alpha = 46\%$ ,  $k^0 = 10^{-3}$  cm<sup>3</sup>/sec. A linear relation was observed between  $\log k^0$  and  $E_{eff}$ .

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the effective activation energies, which were between  $30 \pm 3$  and  $65 \pm 5$  and between  $10 \pm 2$  and  $26 \pm 3$  kcal/mole for  $\dot{R}$  and  $\dot{RO}_2$  radicals respectively. The pre-exponential constants were anomalously high. To explain the observed phenomena, it is suggested that the activation energy, which apparently depends on the potential barrier for the rotation of polymeric chain segments, decreases with increasing temperature ( $180 - 270^\circ\text{C}$  for  $\dot{R}$ , and  $110 - 200^\circ\text{C}$  for  $\dot{RO}_2$ , i.e. for teflon irradiated under oxygen). The theoretical results may be of use in the study of solid state reactions exhibiting a compensating effect and abnormally high pre-exponential multipliers. There are 2 figures and 2 tables.

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR; Institut khimicheskoy kinetiki i goreniya SO AN SSSR (Institute of Chemical Physics, AS USSR; Institute of Chemical Kinetics and Combustion, Siberian Branch of the AS USSR)

Card 2/2

KUZ'MINSKIY, A.S.; NEYMAN, M.B.; FEDOSEYEVA, T.S.; LEBEDEV, Ya.S.; BUCHACHENKO, A.L.; CHERTKOVA, V.F.

Transformations of free radicals in  $\gamma$ -irradiated polyisoprenes.

Dokl. AN SSSR 146 no.3:611-614 S '62.

(MIRA 15:10)

1. Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti i Institut khimicheskoy fiziki AN SSSR. Predstavleno akademikom V.N. Kondrat'yevym.

(Radicals (Chemistry)) (Gamma rays) (Isoprene)

LEBEDEV, Ya.S.

Electron paramagnetic resonance spectra of a fluorallyl radical.  
Kin.1 kat. 3 no.4:615-616 J1-Ag '62. (MIRA 15:8)

1. Institut khimicheskoy fiziki AN SSSR.  
(Allyl compounds--Spectra)

S/192/62/003/005/001/003  
D267/D308

AUTHORS:

Zhidomirov, G.M., Lebedev, Ya.S. and Tsvetkov, Yu.D.

TITLE:

Form of line in the electronic paramagnetic resonance spectra of peroxide type radicals in oriented polymers

PERIODICAL:

Zhurnal strukturnoy khimii, v. 3, no. 5, 1962, 541-545

TEXT:

It was shown in an earlier paper that the spectrum of peroxide radicals ( $RO_2$ ) in oriented specimens depends on the orientation of the specimen in the magnetic field. To calculate the line form in the e.p.r. spectrum for oriented specimens the authors assumed that (1) the peroxide radical has an axial symmetry of the g factor and (2) the symmetry axes of this factor are distributed randomly in the plane S at right angles to the orientation direction of polymer chains. The calculation has been carried out to the end for the case of an infinitely narrow individual line, when the external magnetic field is parallel to the orientation axis. It has

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D267/D308

been shown that the form of the e.p.r. line can be used for determining the degree of orientation of the chains (such estimation has been carried out for a Teflon specimen oriented by stretching). The paper ends with a discussion of the structure of peroxide type radicals (on the strength of the data showing the temperature dependence of the form of e.p.r. lines). There are 3 figures.

ASSOCIATION: Institut khimicheskoy kinetiki i goreniya SO AN  
Novosibirsk SSSR (Institute of Chemical Kinetics  
and Combustion, Siberian Branch of the AS Novosibirsk,  
USSR); Institut khimicheskoy fiziki AN SSSR (Insti-  
tute of Chemical Physics, AS USSR)

SUBMITTED: June 17, 1961

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5.4600

AUTHORS:

Kuz'minskiy, A. S., Neyman, M. B., Fedoseyeva, T. S.,  
Lebedev, Ya. S., Buchachenko, A. L., Chertkova, V. F.

41337  
S/020/62/146/003/013/019  
B101/B144

TITLE:

Conversions of free radicals in gamma-irradiated polyisoprenes

PERIODICAL:

Akademiya nauk SSSR. Doklady, v. 146, no. 3, 1962, 611-614

TEXT: The initial stage of cis- and trans-polyisoprene structuration caused by 10-50 Mrad Co60 irradiation was studied. The appearance and disappearance of free radicals was ascertained by recording the epr spectrum. An epr spectrum with a signal width of 14 oersteds was observed on trans-polyisoprene after irradiation at room temperature in vacuo. The structure of the radical causing this signal could not be clarified; probably it was formed by separation of a hydrogen atom from the  $\alpha$ -methylene group. At  $-196^{\circ}\text{C}$ , irradiated trans-polyisoprene showed a broad singlet due to superposition of various radical spectra. If air was admitted to the ampoule at room temperature, the spectrum passed over into a peroxide spectrum. No epr spectrum appeared in cis-poly-

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# Conversions of free radicals ...

isoprene at room temperature, owing to quick radical recombination. At  $-196^{\circ}\text{C}$ , cis-polyisoprene showed a spectrum similar to that of trans-compound. The concentration of free radicals at  $-196^{\circ}\text{C}$  was higher than at room temperature. The kinetics of disappearance of free radicals is described by an equation of second degree and corresponds to the recombination  $\text{R}^{\cdot} + \text{R}^{\cdot} \rightarrow \text{stable product}$ . As the slope of the straight lines representing the "reciprocal concentration of free radicals versus time" depends on the dose, it is concluded that in the case of high doses the recombination is impeded by steric hindrances in the amorphous part of the polymer. The following effective constants of radical disappearance have been calculated:

Dose, $\text{r} \cdot 10^{-6}$	10	20	37	47
$K_{\text{eff}}, \text{sec}^{-1} \cdot 10^4$	6.25	4.33	3.34	2.74

Calculation of the degree of cross linking according to P. L. Flory (J. Chem. Phys., 11, 521 (1943)) showed that at 10 Mrad about 600 isoprene units were between two cross links, that the number of cross links increased with the dose, and that at 150 Mrad 1.2 isoprene units were between two cross links. The steady decrease of K with increasing

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number of cross links also proves that with increasing density of the network the mobility of molecular chains is impeded and the recombination of free radicals is rendered difficult. There are 4 figures.

ASSOCIATION: Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti (Scientific Research Institute of the Rubber Industry). Institut khimicheskoy fiziki Akademii nauk SSSR (Institute of Chemical Physics of the Academy of Sciences USSR)

PRESENTED: May 21, 1962, by V. N. Kondrat'yev, Academician.

SUBMITTED: May 25, 1962

Card 3/3

LEBEDEV, Ya.S.; CHERNIKOVA, D.M.; TIKHOMIROVA, N.N.; VOYEVODSKIY, V.V., otv. red.; BUTOMO, N.N., red. izd-va; SIMKINA, G.S., tekhn. red.; POLENOVO, T.P., tekhn. red.

[Atlas of electron paramagnetic resonance spectra; theoretically computed multicomponent symmetric spectra] Atlas spektrov elektronogo paramagnitnogo rezonansa; teoreticheski rasschitannye mnogokomponentnye simmetricheskie spektry. Moskva, Izd-vo Akad. nauk SSSR, 1962. 228 p. (MIRA 15:12)

1. Akademiya nauk SSSR. Institut khimicheskoy fiziki. 2. Laboratoriya khimicheskoy radiospektroskopii Instituta khimicheskoy fiziki Akademii nauk SSSR (for Lebedev, Chernikova, Tikhomirova). (Paramagnetic resonance and relaxation—Spectra)

BUCHACHENKO, Anatoliy Leonidovich; LEBEDEV, Ya.S., red.; DOROKHINA,  
I.N., tekhn. red.

[Stable radicals] Stabil'nye radikaly. Moskva, Izd-vo  
AN SSSR, 1963. 170 p. (MIRA 17:1)  
(Radicals (Chemistry))